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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/146,610	05/14/2002	Haig Dolabdjian	635.310USI1	8059

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EXAMINER	
WILSON, JOHN J	
ART UNIT	PAPER NUMBER
3732	

DATE MAILED: 09/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.

EXAMINER

ART UNIT	PAPER

09272004

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

See attached sheet.

The amendment filed on August 4, 2004 amending all claims drawn to the elected invention such that the amendment is now presenting only claims drawn to a non-elected invention is non-responsive (MPEP § 821.03). The remaining claims are not readable on the elected invention because a dental part as originally claimed belongs in class 433/218. An intermediate for being made into a dental part is classified in class 428/542.8, therefore, the present amended claims are to a distinct invention as evidenced by their separate classification in the art.

Since the above-mentioned amendment appears to be a *bona fide* attempt to reply, applicant is given a TIME PERIOD of ONE (1) MONTH or THIRTY (30) DAYS, whichever is longer, from the mailing date of this notice within which to supply the omission or correction in order to avoid abandonment. EXTENSIONS OF THIS TIME PERIOD UNDER 37 CFR 1.136(a) ARE AVAILABLE.

Conclusion

Any inquiry concerning this communication should be directed to John Wilson at telephone number (703) 308-2699.

John J. Wilson

John J. Wilson
Primary Examiner
Art Unit 3732

jjw
September 27, 2004
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curing the low dielectric constant insulating material (18) by cured at about 300°C by a hot plate bake on the spin-coater (see col. 4, lines 39-42).

depositing a thin layer of stabilizing material (20, a silicon nitride which is a non-oxide compound, as claimed in claim 25) over the low dielectric constant insulating material layer (18), by plasma with the thickness of about 1000-3,000A°, (see col. 4, lines 42-60),

depositing a cap silicon oxide layer (22) by PECVD with the thickness about 16,000A° on the stabilizing layer (20), (as claimed in claim 27),

planarizing the silicon oxide cap layer (22) by CMP (see col. 4, lines 61-67),

repeating above steps to form multiple levels of interconnections (see col. 5, lines 6-12).

Jeng et al. '186 teaches that silicon nitride layer is used as a stabilizing layer, but fails to teach that silicon nitride can be used as an adhesion promoter layer as well. Nevertheless, such processing step is known in the semiconductor processing art as evidenced by Lucas. Lucas teaches forming a silicon nitride adhesion layer (32) over low dielectric constant insulator material layer (26) (see col.5, lines 1-13). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have used the silicon nitride layer both as an adhesion promoter layer and stabilizing layer in Jeng et al.'s process as taught by Lucas ***because*** inserting the silicon nitride layer between the cap silicon oxide layer and the underlying low dielectric constant material layer would eliminate the adhesion problem when cap silicon oxide layer formed over the underlying low dielectric constant material layer.

Claim 24 is stand rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng et al. (U.S. Patent No. 6,114,186) in view of Lucas (U.S. Patent No. 6,287,951) as applied to claims 23, 25, 27, further in view of You et al. (U.S. Patent No. 6,197,703) as previously applied.

Jeng et al.'186 in view of Lucas does not specifically show curing the low dielectric material in the conditions at 400°C for 1 hr., in a nitrogen ambient gas flow from about 1 to 30 SLM, oxygen less than 10 ppm (as required by claim 24). Nevertheless, such processing steps are known in the semiconductor processing art as evidenced by You et al. You et al. teaches forming a low dielectric constant material layer HSQ (24, see figure 1), which is a spin-on dielectric layer, and curing the low dielectric constant material layer HSQ (24) by baking in an oven in an inert gas (which includes nitrogen gas) ambient at 400°C for an hour (see col. 5, lines 10-21).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to cure the low dielectric constant layer in a nitrogen gas ambient in Jeng et al.'s process as taught by You et al. ***because*** curing the low dielectric constant material layer HSQ at 400°C for 1 hr., in a nitrogen gas ambient would form a layer of low dielectric constant material layer containing lower moisture/solvent in the material, therefore, it increases the adhesion strength when overlying layer is formed on the surface, and it also improves the surface uniformity and planarization.

It is would also have been obvious to a person of ordinary skill in the art at the time the invention was made that there is no oxygen in the inert gas ambient or vacuum because You et al. teaches curing the low dielectric constant material layer HSQ in an inert gas ambient or

vacuum (see col. 5, lines 16-18), therefore, the oxygen content must be less than 10 ppm in an inert gas ambient or vacuum (as required by claim 24).

The specific gas flow range of the nitrogen gas as claimed are taken to be obvious since these are variables of art recognized importance which are subject to routine experimentation and optimization and discovery of an optimum value for a known process is obvious. In re Aller, 105 USPQ 233 (CCPA 1955). And, even if applicants' modification results in great improvement and utility over the prior art, it may still not be patentable if the modification was within the capabilities of one skilled in the art, In Re Sola 25 USPQ 433.

Therefore, one of ordinary skill in the requisite art at the time the invention was made would have used specific nitrogen gas flow range to cure the HSQ low dielectric constant material which has a thickness of greater 4000 angstroms (see col. 5, lines 26-35 of Jeng et al. '186) ***because*** using specific nitrogen flow rate would decrease the drying time for the solvent in the HSQ material layer to evaporate out of the material, and with the combination of specific nitrogen gas flow rate, film thickness and curing temperature could also cause the HSQ material to reflow and filling the wafer's channel.

Claim 26 is stand rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng et al. (U.S. Patent No. 6,114,186) in view of Lucas (U.S. Patent No. 6,287,951) as applied to claims 23, 25, 27, further in view of Jeng et al. (U.S. Patent No. 5,818,111) as previously applied.

Jeng et al.'186 in view of Lucas does not specifically show the thickness of the silicon nitride layer between about 200-500 A^{o} (as required by claim 26). Nevertheless, such processing steps are known in the semiconductor processing art as evidenced by Jeng et al.'111 (see figures

1, 5), Jeng et al. '111 teaches a method for fabricating multilevel metal interconnections having low dielectric constant insulators on a substrate comprising the steps of: providing first metal lines (14), formed over the substrate (10), coating a layer of low dielectric constant insulating material HSQ (18) over and in between the metal lines (14), depositing a thin layer of a stabilizing material (20, Si_3N_4) by plasma (also known as plasma enhanced chemical vapor deposition) with the thickness of about 100-3000 A° (see col. 4, lines 25-28).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to deposit a thin layer of stabilizing material by plasma with the thickness of about 100-3000 A° in the process of Jeng et al.'186 as taught by Jeng et al.'111 ***because*** silicon nitride with a specific range of thickness would prevent the moisture in the ambient diffuse into the low dielectric constant material HSQ layer, therefore, a more stable layer of HSQ material with higher degree of adhesion property and less moisture content in the material can be achieved.

Response to Arguments

Applicant's arguments filed 8/8/03 have been fully considered but they are not persuasive.

Applicant contends that Jeng does not teach curing condition at the temperature of 400°C. In response to applicant that Jeng teaches forming a spun on dielectric layer (HSQ) and curing the layer at the temperature of 300°C (see col. 4, lines 31-42). However, the reference does not

teach curing the layer at the temperature of 400°C. You teaches in figures 1-2, col. 5, lines 10-60).

Applicant contends that Jeng does not teach stabilizing material. In response to applicant that Jeng teaches depositing a thin layer of stabilizing material (20, a silicon nitride which is a non-oxide compound, as claimed in claim 25) over the low dielectric constant insulating material layer (18), by plasma with the thickness of about 1000-3,000A°, (see col. 4, lines 42-60).

Applicant contend that the prior art does not teach or suggest the PECVD deposition of the adhesion/stabilizer SiN layer and thickness range. In response to applicant that Jeng teaches depositing a cap silicon oxide layer (22) by PECVD with the thickness about 16,000A° on the stabilizing layer (20). However, Jeng does not teach the specific thickness range. Jeng et al. '111 teaches depositing a thin layer of a stabilizing material (20, Si_3N_4) by plasma (also known as plasma enhanced chemical vapor deposition) with the thickness of about 100-3000 A° (see col. 4, lines 25-28).

Applicant contends that the thickness of the cap oxide layer. In response to applicant that Jeng teaches the forming a cap silicon oxide layer (22, see col. 4, lines 67) wherein the thickness of about 16000A° (noted that *About* permits some tolerance. At least about 10% was held to be anticipated by a teaching of a content not to exceed about 8%. *Inre* Ayers, 154 F2d 182, 69 U.S.P.Q. 109 (C.C.P.A. 1946). *In re* Erickson, 343 F 2d 778, 145 U.S.P.Q.207(C.C.P.A 1965).

Applicant contends that neither Jeng nor Lucas teaches SiN layer is as a stabilizing layer as well as an adhesion promoter. In response to applicant that Jeng teaches using the SiN layer as a stabilizing layer while Lucas teaches using SiN layer as an adhesion promoter. Therefore it

would have been obvious that the silicon nitride layer use as both stabilizing layer as well as an adhesion promoter because the process would eliminate the adhesion problem.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (703) 308-9439, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, can be reached on (703) 308-4940. The fax phone number for this Group is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (**See MPEP 203.08**).

Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN